

AMENDMENTS TO THE DRAWINGS

Applicant submits herewith nine sheets of formal replacement drawings for Figures 113-121.

Attachment: 9 Replacement Sheets

REMARKS

Claims 1, 2 and 4 have been examined and have been rejected under 35 U.S.C. § 103(a).
Claims 3, and 5-52 are currently withdrawn as being directed to a non-elected invention.

I. Preliminary Matters

The Examiner has objected to Figures 113-121 and maintains that such figures should be labeled as “prior art.” Accordingly, Applicant submits herewith nine sheets of formal replacements drawings labeled as “prior art.”

Also, Applicant respectfully requests that the Examiner indicate whether the replacement sheets of drawings filed on October 30, 2009 are acceptable (i.e., Figs. 23 and 47).

II. Election of Species/Newly Added Claims

In response to the September 30, 2009 Election of Species Requirement, Applicant merely elected claims 1, 2 and 4. Applicant inadvertently did not elect claims 31 and 32 as also being readable on species “a” directed to the spindle of Figure 16 in combination with the bearing of Figure 1). With regard to claims 31 and 32, Applicant refers to paragraphs [0343] and [0468] of the Publication of the present Application (i.e., US 2006/0239598). In the cited paragraphs, it is clearly disclosed that the machine tool spindle unit and the high speed motor spindle unit can be provided according to the first embodiment which is illustrated in Figures 1 and 16. Thus, the features of claims 31 and 32 are directed to the elected species.

In view of the foregoing, Applicant hereby cancels the withdrawn claims 31 and 32, without prejudice or disclaimer, and adds new claims 107 and 108 which include identical features of claims 31 and 32. At least based on the reasoning set forth above, Applicant

respectfully requests that new claims 107 and 108 be examined on their merits in the present Office Action.

Furthermore, Applicant has also added new claims 109-111 to provide more varied protection of the claimed invention. Applicant submits that such claims read on the elected species.

III. Rejections under 35 U.S.C. § 103(a) in view of U.S. Patent No. 5,711,615 to Stitz et al. (“Stitz”)

The Examiner has rejected claims 1, 2 and 4 under 35 U.S.C. § 103(a) as allegedly being unpatentable over Stitz.

A. Claim 1

Applicant submits that claim 1 is patentable over the cited reference. For example, claim 1 recites, “a grease supply system for supplying a grease to an inside of the rolling bearing; wherein the grease supply system supplies the grease such that a supply amount in one shot is set to 0.004 cc to 0.1 cc.”

In the claimed invention, the upper limit of the supply amount of the grease in one shot is defined as 0.1 cc. An advantage of this feature is that the generation of the temperature pulsation is prevented, as shown in Figures 26(a) and 26(b) which are reproduced below.

FIG. 26 (a)

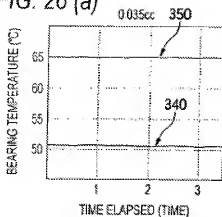
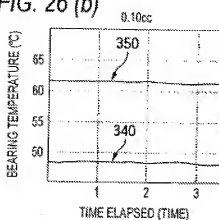


FIG. 26 (b)



Further, Applicant submits that the inventors have found that the generation of the temperature pulsation depends on the supply amount of the grease in one shot. More specifically, when the grease is shot into the inside of the rolling bearing by an amount exceeding a threshold, the temperature of the bearing increases temporarily in a pulsed manner, see, e.g., Figures 26(c) to 26(e), due to an increase in agitation resistance of the solid component of the grease and also due to an excessive amount of base oil of the grease at the contact portion between the rolling element and the raceway of the ring. As the rotation is further carried out thereafter, it returns to a steady state.

FIG. 26 (c)

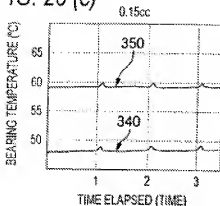


FIG. 26 (d)

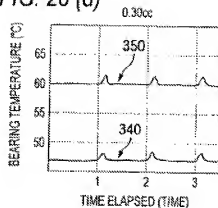
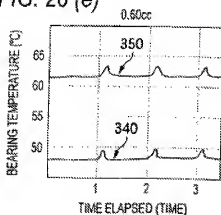


FIG. 26 (e)



Applicant submits that the temperature pulsation becomes a problem especially in a case of a machine tool, since the length of the spindle is changed due to a temporal change in temperature, thereby a machining precision is adversely affected.

Further, in a case where the spindle is rotated at a high speed, such as in a machine tool or in a high-speed motor, the temperature increase of the temperature pulsation lowers the viscosity of the base oil of the grease so that the grease film at the contact portion becomes thin, which may cause a metallic contact to result in a wear or a heat-seizure.

Turning now to the prior art rejection set forth in Office Action, the Examiner asserts that it would have been obvious to one of ordinary skill in the art at the time of the invention was made to configure the lubricant system of Stitz to supply between 0.004 cc and 0.1 cc of lubricant to the bearing, the motivation being to *optimize* the bearing performance for a particular application (pg. 4 of Office Action). In this regard, the Examiner asserts that discovering an optimum value of a result effective variable involves only routine skill in the art.

Applicant respectfully traverses the Examiner's assertion. For example, a particular parameter must first be recognized as a result-effective variable, i.e., a variable which achieves a recognized result, before the determination of the optimum or workable ranges of said variable might be characterized as routine experimentation. MPEP §2144.05(II)(B); *In re Antonie*, 559 F.2d 618, 195 USPQ 6 (CCPA 1977). Applicant submits that Stitz is silent about the temperature pulsation and the grease. That is, Stitz fails to recognize "the supply amount of the grease in one shot" as a variable which affects the temperature pulsation in a grease lubrication system (i.e., not a result-effective variable). Thus, Applicant submits that it would not have been obvious to one of ordinary skill in the art to reach the claimed range of the supply amount of the grease in one shot.

At least based on the foregoing, Applicant submits that claim 1 is patentable over the cited reference.

B. Claims 2 and 4

Applicant submits that claims 2 and 4 are patentable at least by virtue of their dependency upon claim 1.

IV. Conclusion

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,

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